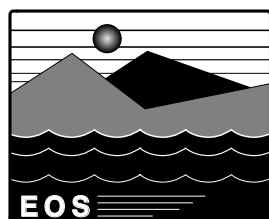# GLAS Science Data Management Plan

Preliminary

December 31, 1995

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EOS

Foreword

This document was prepared by the Observational Science Branch at NASA GSFC/ WFF, Wallops Island, VA, in support of Bob E. Schutz, GLAS Science Team Leader for the GLAS Investigation. This work was performed under the direction of David W. Hancock, III, who may be contacted at (804) 824-1238, hancock@osb1.wff.nasa.gov (e-mail), or (804) 824-1036 (FAX).

Items to be Resolved

1) Content of the NOAA Meteorological Data File (GLA ANC 01) for the tropospheric corrections to the LASER range measurements also needs to be verified.

2) Content of the IERS Polar Motion and Earth Rotation Data File (GLA ANC 04) needs to be verified.

3) Content of the NOAA/CMDL Magnetic and Solar Flux Data File (GLA ANC 05) needs to be verified.

4) The format of the externally-generated input files are TBD, and need to be mutually agreed upon with the source agencies.

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Preface

This GLAS Science Data Management Plan addresses the control of the GLAS Standard Data Product files and of the ancillary data files. This document describes the data flow, interfaces, and data formats associated with these files.

The term "Standard Data Products" refers to those EOS instrument data products listed in the Earth Science Data and Information System (ESDIS) Project data base that are routinely generated within the EOSDIS Core System (ECS) or Science Computing Facilities (SCFs). Each data product has a unique Product Identification code assigned. These data products will have been physically generated as a collection of EOS data parameters in a product aggregate or file. Data parameters will be retrievable from the ECS. Data parameters are composed of GLAS elements, i.e., data items and arrays of items. The arrays and data items consist of measured or derived instrument values.

The term "ancillary data file" indicates an external data file or an internally-generated data file that is to be used in the production of standard GLAS data products. The external ancillary data files will be obtained either through ECS or other designated sources. These files will be delivered to the ECS or GLAS SCF for GLAS data production.

Introduction

1.1 Identification of Document

This document is identified as the GLAS Science Data Management Plan. The unique document identification number within the GLAS Ground Data System numbering scheme is GLAS-DPS-1200. Successive editions of this document will be uniquely identified by the cover and page date marks.

1.2 Scope of Document

This document addresses the identification, authority, and description of the interface nodes associated with the GLAS Standard Data Products and the GLAS Ancillary Data. This document identifies the controlling authority for each of the files and products discussed.

The interface aspect is primarily directed toward the generating software system, and the recipient destination software nodes associated with each data file. For ancillary files, the source is defined as the location or system from which the file is obtained for GLAS standard data product generation. The actual generation method of the ancillary files and all locations where they may reside are not discussed. The data files are those standard data products and ancillary data files identified in Table 1-1 "GLAS File Description Table". This document specifically avoids the human or "people-ware" interface considerations. The intended audience for this document is the GLAS Science and Instrument Engineering Teams, the ESDIS Project, the community of EOS data users and investigators, and the GLAS Ground Data System Team.

Table 1-1   GLAS File Description Table

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA00	GLAS Instrument Packet File	GLA00	GSFC	Archive	EDOS
GLA01	Level 1A Product File	GLA01	NSIDC	Archive	NSIDC
GLA02	Level 1B Non-Instrument Corrections File	GLA02	NSIDC	Archive	NSIDC
GLA03	Level 1B Altimeter Height File	GLA03	NSIDC	Archive	NSIDC
GLA04	Level 1B Product, Atmosphere File	GLA04	NSIDC	Archive	NSIDC
GLA05	Aerosol Vertical Structure and Boundary Layer Height File	GLA05	NSIDC	Archive	NSIDC

n/a - SPSO equivalent not available
N/A - Not applicable

Table 1-1   GLAS File Description Table (Continued)

File ID	File Name	SPSO Equivalent	Archive Site	File Disposition	Source
GLA06	Cloud Height for Multiple Layers File	GLA06	NSIDC	Archive	NSIDC
GLA07	Ice Sheet Elevation and Roughness File	GLA07	NSIDC	Archive	NSIDC
GLA08	Sea Ice Roughness File	GLA08	NSIDC	Archive	NSIDC
GLA09	Thin Cloud/Aerosol Optical Depth File	GLA09	NSIDC	Archive	NSIDC
GLA10	Land Topography File	GLA10	NSIDC	Archive	NSIDC
GLA11	Vegetation Canopy Height File	GLA11	NSIDC	Archive	NSIDC
GLA ANC 01	Meteorological Data File	n/a	N/A	Transfer to SCF	NOAA
GLA ANC 02	Operational Orbit and Attitude Data File	n/a	N/A	Transfer to SCF	EDOS
GLA ANC 03	Laser Tracking Data File	n/a	N/A	Interim	CDDIS
GLA ANC 04	IERS Polar Motion and Earth Rotation Data File	n/a	N/A	Interim	UTCSR
GLA ANC 05	Magnetic and Solar Flux Data File	n/a	N/A	Interim	NOAA
GLA ANC 06	GLAS Metadata and Data Product Quality Data File	n/a	NSIDC	Archive	GLAS SCF
GLA ANC 07	GLAS Coefficients and Constants File	n/a	NSIDC	Permanent	GLAS SCF
GLA ANC 08	Precision Orbit Data File	n/a	N/A	Interim	GLAS SCF
GLA ANC 09	Precision Attitude Data File	n/a	N/A	Interim	GLAS SCF
GLA ANC 10	GPS Tracking Data File	n/a	N/A	Interim	CDDIS
GLA ANC 11	Miscellaneous	n/a	NSIDC	Archive	UTSCR

n/a - SPSO equivalent not available
N/A - Not applicable

1.2.1   Purpose and Objectives of Document

The purpose of the GLAS Science Data Management Plan Document is to provide a descriptive document for the GLAS standard science data product files and ancillary files as well as their associated interfaces. The data interfaces are approached from

the standpoint of the generating and receiving software systems and the associated hardware subsystems or facilities where the software is resident. This document briefly describes the purpose, content, format, source, destination, and the control authority of the GLAS Standard Science Data Products and ancillary data files.

1.3 Document Status and Schedule

The GLAS Science Data Management Plan is currently being issued as a DRAFT edition of the in-progress document. The schedule defined in Table 1-2 "Document Delivery Schedule" lists the planned editions and updates for this document.

Table 1-2   Document Delivery Schedule

Edition/Revision Designation	Document Edition Description	Edition Delivery Focus	Activity/ Delivery Dates
DRAFT 1	Incorporate revised EOSDIS terminology	Internal Review	December 1995
DRAFT 2	Update file description and data sources	Internal Review	December 1995
PRELIMINARY	Revised document edition delivered to EOSDIS by GLAS Science Team Leader	EOSDIS, EOS	December 1995

1.4 Document Organization

This document's outline is assembled in a form similar to those presented in the NASA Software Engineering Program [Information Document 2.3a].

Section 2

Related Documentation

2.1 Parent Documents

The GLAS Science Data Management Plan represents a data description that is a roll-out from the GLAS Science Software Management Plan as the parent document. Specific topics pertaining to data descriptions are located in the Interface Control Plan section under the Development Activities Plan template, NASA-DID-M200.

This document is subordinate to any top-level mission or instrument management plan documents. The recognized external EOSDIS and GLAS parent documents superior to the GLAS Science Data Management Plan are listed below.

a) *EOS ALT/GLAS Mission Requirements Document,* Version 1.5, July 1993, Center for Space Research, University of Texas at Austin.

b) *GLAS Science Software Management Plan*, Preliminary, December 31, 1995, NASA Goddard Space Flight Center, Wallops Flight Facility.

2.2 Applicable Documents

The following documents are related to, or contain policies or references pertinent to the contents of the GLAS Science Data Management Plan.

a) *GLAS Standard Data Products Specification - Level 1*, Preliminary, December 31, 1995, NASA Goddard Space Flight Center, Wallops Flight Facility.

b) *GLAS Standard Data Products Specification - Level 2*, Preliminary, December 31, 1995, NASA Goddard Space Flight Center, Wallops Flight Facility.

c) *GLAS Level 0 Instrument Data Product Specification*, Preliminary, December 31, 1995, NASA Goddard Space Flight Center, Wallops Flight Facility.

2.3 Information Documents

The following documents are provided as sources of information that provide background or supplemental information that may clarify or amplify material in the GLAS Science Data Management Plan.

a) *NASA Software Documentation Standard Software Engineering Program*, NASA, NASA-STD-21000-91, July 29, 1991.

b) *The Geoscience Laser Altimetry/Ranging System*, IEEE Transactions on Geoscience and Remote Sensing, Vol. GE-25, No. 5, September 1987.

c) *EOS Altimetry/GLAS Phase-A Study*, NASA Goddard Space Flight Center, November 1995.

d) *Memorandum: GLAS Data Products*, Center for Space Research, University of Texas at Austin, December 23, 1993.

e) *Science User's Guide and Operations Procedure Handbook for the ECS Project, Vol. 4: Software Developer's Guide to Preparation, Delivery, Integration and Test with ECS*, Hughes Information Technology Corporation, August 1995.

System Descriptions

This section provides, with respect to the GLAS standard data product generation, a description of the GLAS Ground Data System, its technical interfaces, and the interface control.

3.1   Ground Data System

The GLAS Ground Data System (GDS) is the system which provides data processing and mission support for the GLAS investigation. The data processing includes the software and operations which produce the GLAS standard data products at the EOSDIS Core System (ECS) and the GLAS Science Computing Facility. Mission support includes the assessment of the GLAS instrument health and instrument command at the GLAS Instrument Support Terminal. This document is concerned with the files required or produced by the standard data product generation. These files and their controlling authority are listed in Table 3-1 "Data Interface Control Organizations". The source and destination of each of the files are depicted in Figure 3-1 "The GLAS Ground Data System's Standard Product Generation".

The standard data product generation involves the following functions:

- obtain/create input data
- create the data products
- assess the products for quality and content

In order to fulfill these functions, the following processes are performed for each data product:

- obtain/create input files
- execute product generation software
- store data product
- retrieve data product
- assess data product
- report results

The input data will be other standard data products and ancillary files. The ancillary files will be either obtained from sources external to GLAS or will be created by processes internal to the GLAS standard data product generation. The responsible parties for each process and the file sources and destinations are defined in Section 4 and 5.

Parent Document 2.1b, the "GLAS Science Software Management Plan", describes the Ground Data System software in detail.

Table 3-1   Data Interface Control Organizations

| Control Authority	File	File Name
EOSDIS	GLA00	GLAS Instrument Packet File
	GLA01	Level 1A Product File
	GLA02	Level 1B Non-Instrument Corrections File
	GLA03	Level 1B Altimeter Height File
	GLA04	Level 1B Product, Atmosphere File
	GLA05	Aerosol Vertical Structure and Boundary Layer Height File
	GLA06	Cloud Height for Multiple Layers File
	GLA07	Ice Sheet Elevation and Roughness File
	GLA08	Sea Ice Roughness File
	GLA09	Thin Cloud/Aerosol Optical Depth File
	GLA10	Land Topography File
	GLA11	Vegetation Canopy Height File
	GLA ANC 02	Operational Orbit and Attitude Data File
GLAS Science Team	GLA ANC06	GLAS Metadata and Data Product Quality File
	GLA ANC 08	Precision Orbit Data File
	GLA ANC 09	Precision Attitude Data File
	GLA ANC 11	Miscellaneous
GLAS Science and Engineering Teams	GLA ANC 07	GLAS Coefficients and Constants EOSDIS File
NOAA	GLA ANC 01	Meteorological Data File
	GLA ANC 05	Magnetic and Solar Flux Data File
Crustal Dynamics Data and Information System	GLA ANC 03	Laser Tracking Data File
	GLA ANC 10	GPS Tracking Data File
Center for Space Research at the University of Texas at Austin	GLA ANC 04	IERS Polar Motion and Earth Rotation Data File
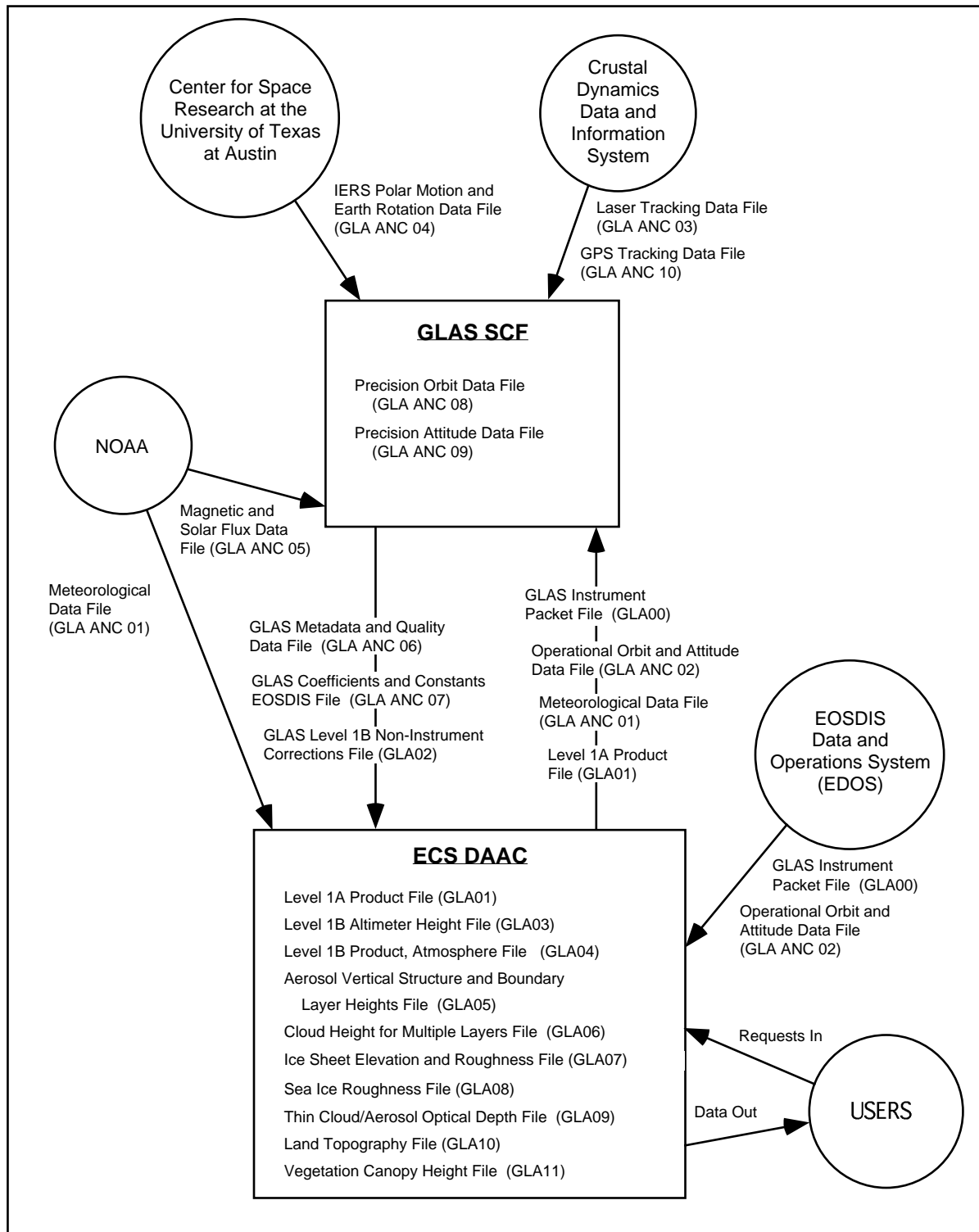
Figure 3-1 The GLAS Ground Data System's Standard Product Generation

3.2   Technical Interfaces

The GLAS Ground Data System interfaces with the EOS Data and Operations System, the ECS, and the GLAS SCF. Additionally, the GLAS Ground Data System will interface with various locations to obtain ancillary data. The following section provides general functional descriptions of each of the interfaces.

3.2.1   EOS Data and Operations System (EDOS)

The primary responsibilities of EDOS are command, control, and data communications. EDOS is the connection node to EOS spacecraft. EDOS-collected real-time and reduced data are available to the Instrument Support Terminals (IST) and are archived in the DAAC for subsequent quality control and science data processing.

GLAS real-time data are available for GLAS Instrument Team access, for instrument performance assessment and engineering analysis processing. Upon delivery to the DAAC, the Level 0 data are available for standard product generation.

3.2.2   EOSDIS Core System (ECS)

The ECS DAAC is the host for standard data product generation. The Level 1A, most of the Level 1B, and the Level 2 data products will be produced on the DAAC. The ECS DAAC will ensure that ancillary data are available prior to performing standard data product generation. It is the specific recipient for the tested and qualified science data product generation software, containing the science algorithms documented in the Algorithm Theoretical Baseline Documents and in the Data Product Generation Software Specifications, and delivered by the GLAS Science Team.

Within the ECS DAAC, all GLAS standard data products are stored and made available for retrieval by the GLAS Science Team and the science community. Metadata describing the quality and content of the GLAS standard data products will be stored as well as any documentation delivered by the GLAS Science Team to the ESDIS project.

3.2.3   GLAS Science Computing Facility (SCF)

The GLAS Science Team operates primarily through the GLAS SCF. The GLAS SCF is a distributed computing system where each GLAS Science Team Member is equipped with a workstation. These workstations may be used in concert with other agency or institutional computer facilities, but the SCF provides the primary link to the ECS. The GLAS Ground Data System Software Development Team will utilize supplemental computer equipment to interface to designated GLAS SCF hosts.

For the GLAS Ground Data System, a portion of the Level 1B Data Product generation will be performed on the GLAS SCF in conjunction with and under GLAS Science Team control. Ancillary files will be generated and collected on the GLAS SCF. The GLAS SCF will support the development and maintenance of the GLAS standard data product generation software, and will be equipped with the ECS Science Data Processing Toolkit.

The GLAS SCF will obtain the standard data products from the ECS DAAC. Processing will be performed on the standard data products to determine quality and content (metadata). The metadata will be transferred to the DAAC for storage and availability to the science community.

3.2.4   Other Interface Nodes

GLAS Ground Data System processing is expected to interface with certain EOS and non-EOS instrument systems data in support of both the Level 1B processing and the ancillary data file collection and generation activities. The sources for the external ancillary data are NOAA, the Crustal Dynamics Data Information System (CDDIS), and the University of Texas Center for Space Research (UTCSR). These sources utilize data provided by the International Earth Rotation Service (IERS) and the International GPS Service for Geodynamics (IGS).

The Crustal Dynamics Data Information System is identified as the data source for laser tracking data and GPS ground-based data to be used in precision orbit determination. This ancillary science processing further includes polar motion and earth rotation data from the IERS via the University of Texas Center for Space Research, and meteorological, magnetic and solar flux data via NOAA.

3.3   Interface Controls

The ESDIS will provide the interface controls for the EDOS and the DAAC. These controls will ensure the security and integrity of the instrument and science data stored within the ECS DAAC. The controls will also ensure the security and integrity of the communications to and from the spacecraft.

The GLAS SCF interface controls will be provided by the GLAS Science Team. Those hardware nodes, physically located at Science Team Member sites and at the NASA Goddard Space Flight Center, are generally under the access control of the assigned investigator, user, and designated custodian. Equipment is generally accessed and used by a single team member, a designated research assistant, or authorized contractor personnel. Routine agency and institutional instructions require investigation-related hardware and software to be attended, and when left unattended, maintained behind locked doors.

Computer systems, hosts, and network nodes operated, supplied by, or maintained by other agencies or institutions are assumed to be under the direct control and authority of that institution or agency. Systems such as the nodes used by the GLAS Science Team at the University of Texas to perform the precision orbit and attitude determination are under the control and operational authority of the University of Texas Center for Space Research. Agency and institution nodes accessing or providing access to other ECS nodes shall be operated and maintained in such a manner as to prevent spurious or unauthorized access or use by non-team parties.

These measures entail proper use of all nodes as designated and authorized. Equipment at node sites shall be used only by the designated user or designated agent, and access shall be controlled in accordance with prescribed procedures and authoriza-

tion. User identification and password measures will be employed in accordance with published NASA Security Guidelines.

3.4   Configuration Management

Configuration management is a key process in maintaining the integrity of the GLAS data files within the SCF and the ECS DAAC, and of the software which produces the files. Configuration management encompasses change control, problem reporting and problem resolution.

Any recommended changes to the baselined software which accepts or produces data files is initiated by an Engineering Change Proposal (ECP). Within the ECP, the revisions are proposed along with implementation considerations and are then submitted to a defined Change Control Board for evaluation. Configuration status accounting reports are maintained, providing a readily available history for each file-type of any content or format changes.

3.5   Quality Assurance

Automatic or manual Quality Assurance (QA) is provided for each Standard Data Product file and ancillary file. Any file requiring manual QA is interimly tagged as unvalidated, but is available for distribution per request. When the manual validation has been completed, the file is marked as validated.

Manual QA at the ECS DAAC is performed as prescribed in the QA policy and procedure manual provided by the GLAS software developers. QA at the SCF is performed by the Science Team. The QA information will be stored within the product metadata.

Section 4
GLAS Standard Data Products

This section describes the standard data products generated by the GLAS Ground Data System. The data products are referenced in this document by their file name and file ID. Current volume and frequency estimates for each of the GLAS standard data products are contained in Table 4-1 "GLAS Standard Data Products Volume and Frequency Estimates". However, the official volume and frequency data are contained in the Applicable Document 2.2a, Applicable Document 2.2b, and Applicable Document 2.2c.

The format of the standard data product files is HDF-EOS. HDF (Hierarchical Data Format) is a multi-object file format that facilitates the transfer of data.

The ECS is responsible for making the GLAS standard data products available to the GLAS Science Team and to the science community. The ESDIS is the controlling authority for the GLAS Standard Data Products. The control authority is the organization responsible for the quality and integrity of a file. The GLAS Science Team is responsible for verifying and validating the standard data products' contents and providing the data quality information. Data quality information and metadata describing each data product will be available through the ECS. In the text that follows the terms "ECS operations team" and "GLAS operations team" are used to generically describe personnel at the DAAC and the GLAS SCF respectively who will perform the routine operations of the GLAS Ground Data System.

Table 4-1   GLAS Standard Data Products Volume and Frequency Estimates

File ID	File Name	Volume (Mb)*	Frequency per Day*	Temporal Coverage
GLA00	GLAS Instrument Packet File	136.20330	14.40000	100
GLA01	Level 1A Product File	80.02950	28.80000	50
GLA02	Level 1B Non-Instrument Corrections File	33.52320	1.00000	1440
GLA03	Level 1B Altimeter Height File	6.94200	28.80000	50
GLA04	Level 1B Product, Atmosphere File	16.52400	28.80000	50
GLA05	Aerosol Vertical Structure and Boundary Layer Height File	78.21600	28.80000	50
GLA06	Cloud Height for Multiple Layers File	0.76200	28.80000	50

*Volume and frequency data are estimates; official data are maintained in Applicable Documents 2.2a, 2.2b, and 2.2c

Table 4-1   GLAS Standard Data Products Volume and Frequency Estimates (Continued)

File ID	File Name	Volume (Mb)*	Frequency per Day*	Temporal Coverage
GLA07	Ice Sheet Elevation and Roughness File	4.45800	28.80000	50
GLA08	Sea Ice Roughness File	5.45400	28.80000	50
GLA09	Thin Cloud/Aerosol Optical Depth File	1.00200	28.80000	50
GLA10	Land Topography File	5.16600	28.80000	50
GLA11	Vegetation Canopy Height File	4.17000	28.80000	50

*Volume and frequency data are estimates; official data are maintained in Applicable Documents 2.2a, 2.2b, and 2.2c

4.1   GLAS Instrument Packet File (GLA00)

4.1.1   Purpose

This file provides the Level 0 raw instrument data to the GLAS Science and Instrument Teams. The data in this file will be used by other processes to monitor the instrument performance and health and to create the Level 1 data products.

4.1.2   Content and Format

This file contains the following:

- Instrument telemetry data
    - Laser Altimeter
    - LIDAR
    - Monitor outputs
    - Status
- Instrument support data
    - Star cameras
    - External laser pointing monitor
    - GPS receiver
- Header and timing elements

The detailed file contents description is contained in the GLAS Level 0 Instrument Data Products Specification, Applicable Document 2.2c.

The detailed file format specification is contained in Applicable Document 2.2c.

4.1.3   Source, Destination, and Transfer Method

This file is produced on the EOSDIS Data and Operations Segment (EDOS) by the Level 0 data processing algorithms; it is then transferred to the ECS DAAC and archived by the ECS operations team. The file is available for retrieval from the ECS DAAC by the GLAS Science and Instrument Teams using the EOSDIS-supplied tools and procedures. The file is used by the Level 1A and 1B standard data products generation algorithms on the DAAC and GLAS SCF. The GLAS operations team will retrieve the Level 0 data from the DAAC to the GLAS SCF. The EOSDIS and GLAS operation teams will ensure this file is created and available prior to the execution time of the Level 1A and 1B algorithms requiring the Level 0 data for input.

4.2   Level 1A Product File (GLA01)

4.2.1   Purpose

This file provides the GLAS telemetry data in engineering units to the GLAS Science Team and to the science community. The data in this file will be used by other processes to create the Level 1B and Level 2 data products.

4.2.2   Content and Format

This file contains the GLAS Level 1A data which is the time-ordered instrument data converted from raw form to engineering units. The file contains altimeter height and waveform data, as well as timing information. The detailed file contents description is contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

The detailed file format specification is contained in Applicable Document 2.2a.

4.2.3   Source, Destination, and Transfer Method

The GLA01 file is produced by the Level 1A standard data processing algorithms on the ECS DAAC and archived at the DAAC by the ECS operations team. The file is used by the Level 1B and Level 2 standard data products generation algorithms on the DAAC. The ECS operations team will ensure that the correct GLA01 file is created and available prior to the execution time of the Level 1B and Level 2 algorithms requiring the data as input. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied file transfer tools and procedures. The GLAS operations team will retrieve the file so that the GLAS Science Team can perform quality and content assessment at the GLAS SCF.

4.3   Level 1B Non-Instrument Corrections File (GLA02)

4.3.1   Purpose

This file provides the corrections to the GLAS data that are not instrument-related. The data in this file will be used by other processes to create the Level 2 data products.

4.3.2   Content and Format

This file contains Level 1B data which are the corrections obtained from the precision orbit location, instrument pointing, and meteorological data. The detailed file contents description is contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

The detailed file format specification is contained in Applicable Document 2.2a.

4.3.3   Source, Destination, and Transfer Method

The GLA02 file is produced on the GLAS SCF by the Level 1B standard data processing algorithms executed by the GLAS operations team. The file is transferred to the ECS DAAC by the GLAS operations team for archival. The ECS operations team archives the data within the ECS DAAC. The file is used by the standard data products generation algorithms which produce the Level 2 products: GLA05, GLA05A, GLA06, GLA07, GLA08, GLA09, GLA10, GLA11 on the DAAC. The ECS operations team ensures that the correct GLA02 file is created and available prior to the execution time of the Level 2 algorithms requiring its data for input. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community. All file transfers are completed using the EOSDIS-supplied tools and procedures.

4.4   Level 1B Altimeter Height File (GLA03)

4.4.1   Purpose

This file provides the altimeter height vector expressed in an Earth-fixed, center-of-mass reference frame. The data in this file will be used by other processes to create the Level 2 data products.

4.4.2   Content and Format

This Level 1B data file contains the following:

- Corrected altimeter height vector (40 hertz)
- Corrections to the height vector
- Precision orbit georeferencing
- Associated timing and data quality information
- Range waveforms

The detailed file contents description is contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

The detailed file format specification is contained in Applicable Document 2.2a.

4.4.3   Source, Destination, and Transfer Method

Level 1B standard data processing algorithms executed by the ECS operations team on the ECS DAAC create the GLA03 file. The file is archived at the ECS DAAC by the

ECS operations team. The GLA03 file is used by the standard data products generation algorithms on the ECS DAAC to produce the following Level 2 products: GLA07, GLA10. The ECS operations team ensures that the correct file is created and available prior to the execution time of the Level 2 algorithms requiring GLA03 for input. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The GLAS operations team will retrieve the file so that it is available for quality and content assessment at the GLAS SCF.

4.5   Level 1B Product, Atmosphere File (GLA04)

4.5.1   Purpose

This file provides the attenuated backscatter vertical profile to the GLAS Science Team and to the science community. The data in this file will be used by other processes to create the Level 2 data products.

4.5.2   Content and Format

This Level 1B data file contains the corrected attenuated backscatter vertical profile. The precision orbit georeference location, timing, and quality information for the profile are contained in the file. The detailed file contents description is contained in the GLAS Level 1 Standard Data Products Specification, Applicable Document 2.2a.

The detailed file format specification is contained in Applicable Document 2.2a.

4.5.3   Source, Destination, and Transfer Method

The GLA04 file is produced on the ECS DAAC by the Level 1B standard data processing algorithms executed by the ECS operations team. The EOSDIS operations team archives the GLA04 file at the ECS DAAC. The file is used by the standard data products generation algorithms on the ECS DAAC to produce the Level 2 GLA05 product. The ECS operations team will ensure that the correct GLA04 file is created and available prior to the execution time of the Level 2 algorithms requiring the data for input. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF.

4.6   Aerosol Vertical Structure and Boundary Layer Height File (GLA05)

4.6.1   Purpose

This file provides the GLAS aerosol and cloud data and the GLAS aerosol boundary layer heights for atmosphere and climate studies to the GLAS Science Team and to the science community. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.6.2 Content and Format

This file contains the following:

- Aerosol vertical structure
- Aerosol backscatter cross section
- Aerosol extinction cross section
- Cloud 1064nm backscatter cross section
- Cloud absorption cross section
- Cloud 532nm backscatter cross section

This file also contains the Level 2 aerosol boundary layer heights as derived from the aerosol structure. The layer heights data in this file occur at the 5 hertz rate. Included in the file are the precision orbit georeference location, timing, and quality information. The data in this file occur at both the 5 and 40 hertz rates. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.6.3 Source, Destination, and Transfer Method

The Level 2 standard data processing algorithms executed by the ECS operations team on the ECS DAAC produce the GLA05 file. The file is archived at the ECS DAAC by the ECS operations team. The file is available for retrieval from the DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA05 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.7 Cloud Height for Multiple Layers File (GLA06)

4.7.1 Purpose

This file provides cloud height data to the GLAS Science Team and to the science community for atmosphere and climate studies. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.7.2 Content and Format

This Level 2 data file contains the cloud tops and cloud bottoms referenced from the Earth's center of mass at the 5 hertz rate. Included in the file are the precision orbit georeference location, timing, and quality information. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.7.3   Source, Destination, and Transfer Method

The GLA06 file is produced on the ECS DAAC by the Level 2 standard data processing algorithms executed by the ECS operations team. The file is archived at the DAAC by the ECS operations team. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA06 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.8   Ice Sheet Elevation and Roughness File (GLA07)

4.8.1   Purpose

This file provides the ice sheet elevations and roughness, as determined from the GLAS Level 1 data, for ice sheet morphology and climate studies to the GLAS Science Team and the science community. This file will be used as input to the Level 3 and Level 4 data product processing to produce gridded or mapped data.

4.8.2   Content and Format

This file contains the Level 2 ice sheet elevations above the reference ellipsoid, and the ice sheet surface roughness and reflectivity data, at the 40 hertz rate. The file includes precision orbit georeference location, timing, and quality information, as well as the corrections to the ice sheet elevation, roughness, and reflectivity data. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.8.3   Source, Destination, and Transfer Method

The Level 2 standard data processing algorithms, executed on the ECS DAAC by the ECS operations team, will produce the GLA07 file. The file is archived by the ECS operations team at the ECS DAAC. The file is used by the Level 3 and Level 4 standard data products generation algorithms. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied file transfer tools and procedures. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA07 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.9   Sea Ice Roughness File (GLA08)

4.9.1   Purpose

This Level 2 data file provides sea ice roughness data to the GLAS Science Team and to the science community for ice sheet morphology and climate studies. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.9.2   Content and Format

This file contains the surface roughness and reflectivity data at the 40 hertz rate. Included in the file are the precision orbit georeference location, timing, and quality information, as well as the corrections to the sea ice elevation, roughness, and reflectivity data. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.9.3   Source, Destination, and Transfer Method

The GLA08 file is produced on the ECS DAAC by the Level 2 standard data processing algorithms by the ECS operations team. The file is archived by the ECS operations team at the DAAC. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA08 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.10 Thin Cloud/Aerosol Optical Depth File (GLA09)

4.10.1   Purpose

This file provides the aerosol and cloud optical depth data to the GLAS Science Team and to the science community for atmosphere and climate studies. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.10.2   Content and Format

This file contains the Level 2 aerosol and cloud optical depth data at the 5 hertz rate. Included in the file are the precision georeference orbit location, timing, and quality information. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.10.3   Source, Destination, and Transfer Method

The GLA09 file is produced on the ECS DAAC by the Level 2 standard data processing algorithms executed by the ECS operations team. The file is archived at the ECS

DAAC by the EOSDIS operations team. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOS-DIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA09 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.11 Land Topography File (GLA10)

4.11.1   Purpose

This file provides the land surface height above the reference ellipsoid for land topography studies to the GLAS Science Team and to the science community. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.11.2   Content and Format

This file contains the Level 2 land surface heights (elevations), roughness, and reflectivity. Included in the file are the data corrections, precision orbit georeference location, timing, and quality information. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.11.3   Source, Destination, and Transfer Method

The GLA10 file is produced on the ECS DAAC by the Level 2 standard data processing algorithms executed by the ECS operations team. The file is archived by the ECS operations team at the ECS DAAC. The file is available for retrieval from the DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA10 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

4.12 Vegetation Canopy Height File (GLA11)

4.12.1   Purpose

This file provides vegetation canopy height data to the GLAS Science Team and to the science community for land topography studies. The data in this file will be used by other processes to create the Level 3 and 4 data products.

4.12.2   Content and Format

This file contains the Level 2 vegetation canopy height and vegetation density data at the 40 hertz rate.   Included in the file are the precision orbit georeference location, timing, and quality information. The detailed file contents description is contained in the GLAS Level 2 Standard Data Products Specification, Applicable Document 2.2b.

The detailed file format specification is contained in Applicable Document 2.2b.

4.12.3   Source, Destination, and Transfer Method

The GLA11 file is produced on the ECS DAAC by the Level 2 standard data processing algorithms executed by the ECS operations team. The file is archived by the ECS operations team at the DAAC. The file is available for retrieval from the ECS DAAC by the GLAS Science Team and the science community using the EOSDIS-supplied tools and procedures. The file is used by the Level 3 and Level 4 standard data products generation algorithms on the GLAS SCF. The GLAS operations team will retrieve the file in order to perform quality and content assessment at the GLAS SCF and to produce the Level 3 and 4 data products. The GLAS operations team will ensure that the correct GLA11 files are available prior to the execution time of the Level 3 and 4 algorithms requiring the data for input.

Section 5
Ancillary Data

Ancillary data files are the externally-generated input files and the internally-generated intermediate files used by the GLAS Ground Data System. The ancillary file names and file ID are listed in Table 5-1 "GLAS Ancillary Files Volume and Frequency Estimates", along with estimates of file volume and frequency per day. The format of the ancillary data files is HDF-EOS.

Table 5-1   GLAS Ancillary Files Volume and Frequency Estimates

File ID	File Name	Volume (Mb)*	Frequency per Day*	Temporal Coverage
GLA ANC 01	Meteorological Data File	2.07360	1.00000	1440
GLA ANC 02	Operational Orbit and Attitude Data File	2.07360	1.00000	1440
GLA ANC 03	Laser Tracking Data File	2.07360	1.00000	1440
GLA ANC 04	IERS Polar Motion and Earth Rotation Data File	1.03680	1.00000	1440
GLA ANC 05	Magnetic and Solar Flux Data File	1.03680	1.00000	1440
GLA ANC 06	GLAS Metadata and Data Product Quality Data File	0.07200	28.80000	50
GLA ANC 07	GLAS Coefficients and Constants File	1.00000	n/a	n/a
GLA ANC 08	Precision Orbit Data File	2.07360	1.00000	1440
GLA ANC 09	Precision Attitude Data File	2.07360	1.00000	1440
GLA ANC 10	GPS Tracking Data File	2.07360	1.00000	1440
GLA ANC 11	Miscellaneous	0.10000	n/a	n/a

*Volume and frequency data are estimates; official data are maintained in Applicable Documents 2.2a, 2.2b, and 2.2c

For the ancillary data, the initial control authority is the source or generating site - the control authority will ensure that the data is valid. The source institutions for the externally-generated input data files will perform quality-checking prior to transferal to the GLAS GDS. Once the ancillary data has been delivered to ESDIS, the ESDIS becomes the control authority and will ensure the data's integrity.

Each of the ancillary files is described in terms of: purpose, content, format, source, destination, transfer method, and control authority.

5.1 Meteorological Data File (GLA ANC 01)

5.1.1 Purpose

The Meteorological Data File provides the global meteorological measurements from which corrections for tropospheric retardation of the laser pulses will be determined. This file may actually be one or more files depending on the requirements of the GLAS Science Team. [The GLA01 ATBD as a part will include the process to transform the GLA ANC 01 into atmospheric delay.]

5.1.2 Content and Format

The contents of this file include:

- Global atmospheric pressure fields from which dry tropospheric range corrections are to be computed.

- Global water vapor vertical structure from which wet tropospheric range corrections are to be computed.

- Global temperatures used in the computing of wet tropospheric corrections.

- Uncertainties associated with the measurements of atmospheric pressure fields, water vapor profiles, and temperatures.

- Flags indicative of difficulties associated with acquiring the data and creating the file.

- Date(s) and times for applicability of the data.

A detailed file contents and format description is provided in Appendix A.

5.1.3 Source, Destination, and Transfer Method

The initial source of the file will be the Climate Monitoring and Diagnostics Laboratory (CMDL) of NOAA in Boulder, CO[1]. The Meteorological Data File will be stored at the ESDIS and will be retrieved to the GLAS SCF using the EOSDIS-supplied file transfer tools and procedures. The file will be used as input to interpolation schemes to compute laser range corrections at the subsatellite points as part of the GLAS science data processing.

5.1.4 Control Authority

Initially NOAA/CMDL will ensure the validity of the file contents.   ESDIS will ensure the integrity of the file as stored in the ECS DAAC. GLAS will ensure the integrity of the file as stored in the SCF.

5.1.5 Availability, Storage, and Retention

The ECS operations team will be responsible for retrieving the GLA ANC 01 file from the CMDL of NOAA. The GLAS operations team will retrieve the GLA ANC 01 file

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1. ESDIS external data agreements are coordinated by Dr. Mathew Schwaller of NASA/GSFC, 301-286-0523, schwaller@gsfc.nasa.gov

from the ECS DAAC. This file should be retrieved and available 24 hours prior to executing the algorithm that produces the GLA02 product. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.2   Operational Orbit and Attitude Data File (GLA ANC 02)

5.2.1   Purpose

The Operational Orbit and Attitude Data File provides the Extended Precision Vector used to: 1) compute the operational ephemerides of the spacecraft, and 2) serve as the initial vector for the precision orbit determination. The operational orbit preliminarily georeferences the spacecraft position with respect to time and is used Level 1 standard data product generation; final GLAS data product georeferencing will use the precision orbit data file (GLA ANC 08). In addition to the operational spacecraft orbit data this file will contain the operational spacecraft attitude data.

5.2.2   Content and Format

The contents of this file include:

- The spacecraft's inertial vector x, y, z, vx, vy, vz in km and km/sec.
- The epoch (date and time) of the inertial vector.
- Time-ordered pointing vectors (deviations from nadir) of the spacecraft.
- A detailed file contents and format description is provided in Appendix A.

5.2.3   Source, Destination, and Transfer Method

The source of the operational orbit and attitude data file is the EOSDIS Data and Operations System (EDOS). The file will be used by the standard data products generation algorithms on the ECS DAAC to produce the following Level 1 products: GLA01, GLA03, GLA04. The file will retrieved from EDOS using the EOSDIS-supplied file transfer tools and procedures.

5.2.4   Control Authority

The control authority for this file is the EDOS.

5.2.5   Availability, Storage, and Retention

The ECS operations team will be responsible for retrieving the GLA ANC 02 file from EDOS. This file should be retrieved and available 24 hours prior to executing the Level 1 algorithms requiring its data for input. The ECS operations team shall ensure the file is available for processing. The file should be kept available until there is precision orbit and attitude data (GLA ANC 08 and GLA ANC 09) covering the same time period available.

5.3   Laser Tracking Data File (GLA ANC 03)

5.3.1   Purpose

The Tracking Data File provides the ground-based laser tracking data of the space-craft, for input to the Precision Orbit Determination.

5.3.2   Content and Format

The contents of this file include:

- Time-ordered laser range measurements from identified groundbased laser trackers.

- Uncertainties associated with each laser measurement.

- Flags indicative of difficulties associated with acquiring the data and creating the file.

A detailed file contents and format description is provided in Appendix A.

5.3.3   Source, Destination, and Transfer Method

The initial source of the tracking data file is the Laser Tracking Archive of the Crustal Dynamics Data and Information System (CDDIS) and the IGS[1]. The file will be retrieved from UTCSR to ESDIS, and stored on the GLAS SCF for the precision orbit determination, using standard UNIX file transfer tools and procedures.

5.3.4   Control Authority

The control authority for this file is the ESDIS.

5.3.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for retrieving the GLA ANC 03 file from the ESDIS. This file should be retrieved and available 24 hours prior to executing the precision orbit determination process that requires its data for input. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.4   IERS Polar Motion and Earth Rotation Data File (GLA ANC 04)

5.4.1   Purpose

The IERS Polar Motion and Earth Rotation Data File provides the parameters of polar motion and earth rotation for input to Precision Orbit Determination process.

5.4.2   Content and Format

The contents of this file include:

- Time-ordered polar motion parameters, per International Earth Rotation Service (IERS) standards.

- Time-ordered UT1-TAI time differences.

A detailed file contents and format description is provided in Appendix A.

5.4.3   Source, Destination, and Transfer Method

The initial source of the file will be the Center for Space Research (CSR) at the University of Texas Austin[1]. The file will be retrieved from ESDIS and stored on the GLAS SCF for precision orbit determination, using standard UNIX file transfer tools and procedures.

5.4.4   Control Authority

The control authority for this file is the ESDIS.

5.4.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for retrieving the GLA ANC 04 file from the ESDIS. This file should be retrieved and available 24 hours prior to executing the precision orbit determination process that requires its data for input. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.5   Magnetic and Solar Flux Data File (GLA ANC 05)

5.5.1   Purpose

The Magnetic and Solar Flux Data File provides the magnetic and solar flux parameters for input to the Precision Orbit Determination process. These parameters are used in the computation of drag and solar radiation effects on the spacecraft.

5.5.2   Content and Format

The contents of this file include:

- Global, time-ordered, magnetic parameters.
- Global, time-ordered, solar flux parameters.
- Uncertainties associated with the parameters.
- Flags indicative of difficulties associated with acquiring the data and creating the file.

A detailed file contents description is provided in Appendix A.

5.5.3   Source, Destination, and Transfer Method

The initial source of the file will be the Climate Monitoring and Diagnostics Laboratory (CMDL) of NOAA in Boulder, CO[1]. The file will be retrieved from the ESDIS and stored on the GLAS SCF for the precision orbit determination, using the EOSDIS supplied file transfer tools and procedures.

5.5.4   Control Authority

The control authority for this file is the ESDIS.

5.5.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for retrieving the GLA ANC 05 file from the CMDL of NOAA. This file should be retrieved and available 24 hours prior to executing the precision orbit determination process that requires its data for input. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.6   GLAS Metadata and Data Product Quality File (GLA ANC 06)

5.6.1   Purpose

The GLAS Metadata and Data Product Quality Data File provides information about the GLAS standard Data Products in a narrative form, for the data processing or for the data analyst. It is World Wide Web compatible for ease of retrieval by a variety of data users.

5.6.2   Content and Format

The contents of this file include:

- Product Quality narrative, pertaining to factors which may affect the product.
- Data acquisition narrative, pertaining to environmental or other factors which may have affected the raw data.
- Other information such as a software change which may be of interest to the data analyst.
- Data in digital form.

A detailed file contents and format description is provided in Appendix A.

5.6.3   Source, Destination, and Transfer Method

The Level 1 and 2 standard data products will be reviewed and assessed on the GLAS SCF. The results will be stored in this file. The file will be delivered to the DAAC using the EOSDIS-supplied file transfer tools and procedures.

5.6.4   Control Authority

The initial control authority for this file is the GLAS Science Team. Control then passes to ESDIS upon delivery of the file to the ECS DAAC.

5.6.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for delivering the GLA ANC 06 file to the ECS DAAC. This file should be delivered and available 24 hours after creation on the GLAS SCF. The ECS operations team shall ensure the file is available for retrieval. The file should be available for the life of the GLAS investigation.

5.7   GLAS Coefficients and Constants EOSDIS File (GLA ANC 07)

5.7.1   Purpose

The GLAS Coefficients and Constants EOSDIS File provides the coefficients and constants required by the software which produces the GLAS standard data products. Some coefficients and constants are subject to modification, based on: pre-flight testing, on-orbit performance, or electronic component aging. In order that new versions of software will not need to be created and released due to changes in operating parameters, the GLAS Coefficients and Constants File provides a location to store all software parameters that may need updating during the life of the GLAS mission. Updated parameters will be documented within the file.

5.7.2   Content and Format

The contents of this file include:

- Data conversion coefficients and constants for all the GLAS GDS EOSDIS algorithms used in the processing.

- Global constants such as the speed of light which are used in multiple algorithms.

- Constants such as thresholds, tolerance levels, and limits.

Each parameter contained in the file has an accompanying description. The file will contain a version number and date. A detailed file contents and format description is provided in Appendix A.

5.7.3   Source, Destination, and Transfer Method

The file will be created on the GLAS SCF by the GLAS GDS Software Development Team from inputs provided by the GLAS Science and Instrument Teams. The file will be delivered to the ECS DAAC using the EOSDIS-supplied file transfer tools and procedures. The file will be used by the Level 1 and Level 2 standard data product generation on the ECS DAAC.

5.7.4   Control Authority

The file will be approved by the GLAS Science and Instrument Teams prior to its delivery to ESDIS. ESDIS will ensure the file's integrity once it is stored on the ECS DAAC.

5.7.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for delivering the GLA ANC 07 file to the ECS DAAC. The ECS operations team is responsible for ensuring the file is available prior to executing the processes that require its data as input. The file should be available for the life of the GLAS investigation in case re-processing is required. The latest version of the file would normally be used for re-processing, but the approval/ agreement of the GLAS Science Team must be obtained prior to using the file.

5.8   Precision Orbit Data File (GLA ANC 08)

5.8.1   Purpose

The Precision Orbit Data File provides the time-referenced precision latitude, longitude, and altitude for the center of mass of the spacecraft. Data from this file are used to georeference the Level 2 GLAS standard data products, using a specially-tuned orbit interpolator.

5.8.2   Content and Format

The contents of this file include:

- Time-ordered spacecraft Earth-fixed position vector x, y, z in meters and vx, vy, vz in meters/second, at 30-second intervals (sufficient for GLAS due to lower altitude).

- The date and time of each position vector.

A detailed file contents and format description is provided in Appendix A.

5.8.3   Source, Destination, and Transfer Method

The file will be created by the precision orbit determination process on the GLAS SCF and delivered to the ECS DAAC. The file will be made available for Level 1B processing to create the GLA02 product in the SCF.

5.8.4   Control Authority

Each Precision Orbit File will be verified and approved by the GLAS Science Team prior to its use in subsequent processing.

5.8.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for creating the GLA ANC 08 file. This file should be created and available 24 hours prior to executing the algorithms which create the Level 1B GLA02 product. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.9   Precision Attitude Data File (GLA ANC 09)

5.9.1   Purpose

The Precision Attitude Data File is created in the SCF using GLAS Level 0 star camera data and spacecraft attitude data to determine the off-nadir component of the laser measurement's footprint.

5.9.2   Content and Format

The contents of this file include:

- Time-ordered pointing vectors (deviations from nadir) of the laser, in decimal degrees and direction, from the External Laser Pointing Monitor on the space-

craft.

- Uncertainties associated with the pointing vectors.

A detailed file contents description is provided in Appendix A.

5.9.3   Source, Destination, and Transfer Method

The file will be created from star camera Level 0 data processed on the GLAS SCF. The file will be used on the SCF to create the GLA02 data file. Any file transfers will be accomplished with standard UNIX file transfer tools. This file will be delivered to the ECS DAAC for archiving.

5.9.4   Control Authority

The control authority for this file is the GLAS Science Team.

5.9.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for creating the GLA ANC 09. This file should be created and available 24 hours prior to executing the algorithms that produce the Level 1B GLA02 product. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.10 GPS Tracking Data File (GLA ANC 10)

5.10.1   Purpose

The GPS Tracking Data File provides the ground based Global Positioning System (GPS) receiver data, acquired from selected global GPS stations in the IGS network using the constellation of GPS navigation satellites. It is input to the Precision Orbit Determination software.

5.10.2   Content and Format

The contents of this file include:

- Time-ordered pseudorange and carrier phase from the GPS constellation of satellites.

A detailed file contents description is provided in Appendix A.

5.10.3   Source, Destination, and Transfer Method

This file will be initially obtained from the GPS Tracking Archive of the Crustal Dynamics Data and Information System. The file will be retrieved from the ESDIS and stored in the GLAS SCF using the EOSDIS-supplied file transfer tools and procedures. It is input to the precision orbit determination software in the GLAS SCF.

5.10.4   Control Authority

The control authority for this file is the ESDIS.

5.10.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for retrieving the GLA ANC 10 file from the CDDIS. This file should be retrieved and available 24 hours prior to executing the precision orbit determination process. The GLAS operations team shall ensure the file is available for processing. The file should be available for the life of the GLAS investigation in case re-processing is required.

5.11 Other Data (Miscellaneous) Files (GLA ANC 11)

5.11.1   Purpose

The Miscellaneous Data Files provide the parameters for support of the Precision Orbit Determination (POD) and Precision Attitude Determination (PAD) processes. The POD process requires gravity and tide models, lunar-solar-planetary ephemerides, and coordinates for the ground-based GPS and laser tracking sites. The PAD process requires a star catalog. The specific files for POD and PAD are specified in the ATBD.

5.11.2   Content and Format

The contents of the files for POD support include:

- The real-time Earth Orientation Model -- IERS Terrestrial Reference Frame (ITRF) (updated only once per year).
    - Time-ordered precession parameters, per the IERS reference frame (1976 International Astronomical Union).
    - Time-ordered nutation parameters, per the IERS reference frame (1980 International Astronomical Union).
- ITRF coordinates for tracking stations, including the time rate of change.
- Gravity Field Model.
- Tide Models.
- Time-ordered Planetary Ephemerides.

The contents of the files for PAD support include:

- Celestial Reference Frame (CRF) Star Catalog and ties to CRF (updated infrequently).

Detailed contents and format descriptions for these files are provided in Appendix A.

5.11.3   Source, Destination, and Transfer Method

The initial source of the files will be the IERS via the Center for Space Research (CSR) at the University of Texas Austin and delivered to ESDIS[1]. The files will be retrieved from ESDIS and stored on the GLAS SCF for precision orbit determination and precision attitude determination, using standard UNIX file transfer tools and procedures.

5.11.4   Control Authority

Initially UTCSR will ensure the validity of these file contents. The control authority for these files is the ESDIS.

5.11.5   Availability, Storage, and Retention

The GLAS operations team will be responsible for retrieving the GLA ANC 11 files from the ESDIS. This files should be retrieved and available 24 hours prior to executing the precision orbit determination and precision attitude determination processes that requires their data for input. The GLAS operations team shall ensure the files are available for processing. The files should be available for the life of the GLAS investigation in case re-processing is required.

Appendix A
File Formats

Table 5-2   Content and Format of the Meteorological Data File (GLA ANC01)

To Be Provided

Table 5-3   Content and Format of the Operational Orbit and Attitude Data File (GLA ANC 02)

To Be Provided

Table 5-4   Content and Format of the Laser Tracking Data File (GLA ANC 03)

Standard Laser Format

Table 5-5   Content and Format of the IERS Polar Motion and Earth Rotation Data File (GLA ANC 04)

To Be Provided

Table 5-6   Content and Format of the Magnetic and Solar Flux Data File (GLA ANC 05)

To Be Provided

Table 5-7   Content and Format of the GLAS Metadata and Data Product Quality File (GLA ANC 06)

To Be Provided

Table 5-8   Content and Format of the GLAS Coefficients and Constants EOSDIS File (GLA ANC 07)

To Be Provided

Table 5-9   Content and Format of the Precision Orbit Data File (GLA ANC 08)

To Be Provided

Table 5-10   Content and Format of the Precision Attitude Data File (GLA ANC 09)

To Be Provided

Table 5-11   Content and Format of the GPS Tracking Data File (GLA ANC 10)

Receiver Independent Exchange (RINEX) Format

Table 5-12   Content and Format of the Miscellaneous Data Files (GLA ANC 11)

To Be Provided

Abbreviations & Acronyms

ALT	EOS-Altimeter spacecraft series
ATBD	Algorithm Theoretical Baseline Document
CDDIS	Crustal Dynamics Data and Information System
CMDL	Climate Monitoring and Diagnostics Laboratory
CRF	Celestial Reference Frame
CSR	Center for Space Research at the University of Texas
DAAC	Distributed Active Archive Center
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EOC	EOS Operating Center
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ESDIS	Earth Science Data and Information System
GDS	GLAS Ground Data System
GLAS	Geoscience Laser Altimeter System
GPS	Global Positioning System
GSFC	NASA Goddard Space Flight Center at Greenbelt, Maryland
GSFC/WFF	NASA Goddard Space Flight Center/Wallops Flight Facility at Wallops Island, Virginia
HDF	Hierarchical Data Format
ID	Identification
IEEE	Institute for Electronics and Electrical Engineering
IERS	International Earth Rotation Service
IGS	International GPS Service for Geodynamics
IST	GLAS Instrument Support Terminal
ITRF	IERS Terrestrial Reference Frame
LASER	Light Amplification by Stimulated Emission of Radiation
LIDAR	Light Detection and Ranging
N/A	Not (/) Applicable
n/a	Not (/) Available

NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NSIDC	National Snow and Ice Data Center (DAAC)
PAD	Precision Attitude Determination
POD	Precision Orbit Determination
QA	Quality Assurance
RINEX	Receiver Independent Exchange
SCF	GLAS investigation Science Computing Facility and workstation(s)
SDPS	Science Data Processing Segment
TBD	to be determined, to be done, or to be developed
UNIX	the operating system jointly developed by the AT&T Bell Laboratories and the University of California-Berkeley System Division

Glossary

aggregate   A collection, assemblage, or grouping of distinct data parts together to make a whole. It is generally used to indicate the grouping of GLAS data items, arrays, elements, and EOS parameters into a data record. For example, the collection of Level 1B EOS Data Parameters gathered to form a one-second Level 1B data record. It could be used to represent groupings of various GLAS data entities such as data items aggregated as an array, data items and arrays aggregated into a GLAS Data Element, GLAS Data Elements aggregated as an EOS Data Parameter, or EOS Data Parameters aggregated into a Data Product record.

array   An ordered arrangement of homogenous data items that may either be synchronous or asynchronous. An array of data items usually implies the ability to access individual data items or members of the array by an index. An array of GLAS data items might represent the three coordinates of a georeference location, a collection of values at a rate, or a collection of values describing an altimeter waveform.

file   A collection of data stored as records and terminated by a physical or logical end-of-file (EOF) marker. The term usually applies to the collection within a storage device or storage media such as a disk file or a tape file. Loosely employed it is used to indicate a collection of GLAS data records without a standard label. For the Level 1A Data Product, the file would constitute the collection of one-second Level 1A data records generated in the SDPS working storage for a single pass.

header   A text and/or binary label or information record, record set, or block, prefacing a data record, record set, or a file. A header usually contains identifying or descriptive information, and may sometimes be embedded within a record rather than attached as a prefix.

item   Specifically, a data item. A discrete, non-decomposable unit of data, usually a single word or value in a data record, or a single value from a data array. The representation of a single GLAS data value within a data array or a GLAS Data Element.

label   The text and/or binary information records, record set, block, header, or headers prefacing a data file or linked to a data file sufficient to form a labeled data product. A standard label may imply a standard data product. A label may consist of a single header as well as multiple headers and markers depending on the defining authority.

Level 0   The level designation applied to an EOS data product that consists of raw instrument data, recorded at the original resolution, in time order, with any duplicate or redundant data packets removed.

Level 1A   The level designation applied to an EOS data product that consists of reconstructed, unprocessed Level 0 instrument data, recorded at the full resolution with time referenced data records, in time order. The data are annotated with ancillary information including radiometric and geometric calibration coefficients, and georeferencing parameter data (i.e., ephemeris data). The included, computed coefficients and parameter data have not however been applied to correct the Level 0 instrument data contents.

Level 1B	The level designation applied to an EOS data product that consists of Level 1A data that have been radiometrically corrected, processed from raw data into sensor data units, and have been geolocated according to applied georeferencing data.
Level 2	The level designation applied to an EOS data product that consists of derived geophysical data values, recorded at the same resolution, time order, and georeference location as the Level 1A or Level 1B data.
Level 3	The level designation applied to an EOS data product that consists of geophysical data values derived from Level 1 or Level 2 data, recorded at a temporally or spatially re-sampled resolution.
Level 4	The level designation applied to an EOS data product that consists of data from modeled output or resultant analysis of lower level data that are not directly derived by the GLAS instrument and supplemental sensors.
metadata	The textual information supplied as supplemental, descriptive information to a data product. It may consist of fixed or variable length records of ASCII data describing files, records, parameters, elements, items, formats, etc., that may serve as catalog, data base, keyword/value, header, or label data. This data may be parsable and searchable by some tool or utility program.
orbit revolution	The passage of time and spacecraft travel signifying a complete journey around a celestial or terrestrial body. For GLAS and the EOS LASER ALT spacecraft each orbit revolution count starts at the time when the spacecraft is on the equator traveling toward the North Pole, continues through the equator crossing as the spacecraft ground track moves toward the South Pole, and terminates when the spacecraft has reached the equator moving northward from the South Polar region.
parameter	Specifically, an EOS Data Parameter. This is a defining, controlling, or constraining data unit associated with a EOS science community approved algorithm. It is identified by an EOS Parameter Number and Parameter Name. An EOS Data Parameter within the GLAS Data Product is composed of one or more GLAS Data Elements.
pass	A sub-segment of an orbit, it may consist of the ascending or descending portion of an orbit (e.g., a descending pass would consist of the ground track segment beginning with the northernmost point of travel through the following southernmost point of travel), or the segment above or below the equator (e.g., either the northern or southern hemisphere portion of the ground track on any orbit).
product	Specifically, the Data Product or the EOS Data Product. This is implicitly the labeled data product or the data product as produced by software on the SDPS or SCF. A GLAS data product refers to the data file or record collection either prefaced with a product label or standard formatted data label or linked to a product label or standard formatted data label file. Loosely used, it may indicate a single pass file aggregation, or the entire set of product files contained in a data repository.
record	A specific organization or aggregate of data items. It represents the collection of EOS Data Parameters within a given time interval, such as a one-second data record. It is the first level decomposition of a product file.

Standard Data Product
Specifically, a GLAS Standard Data Product. It represents an EOS LASER ALT/ GLAS Data Product produced on the EOSDIS SDPS for GLAS data product generation or within the GLAS Science Computing Facility using EOS science community approved algorithms. It is routinely produced and is intended to be archived in the EOSDIS data repository for EOS user community-wide access and retrieval.

variable
Usually a reference in a computer program to a storage location.